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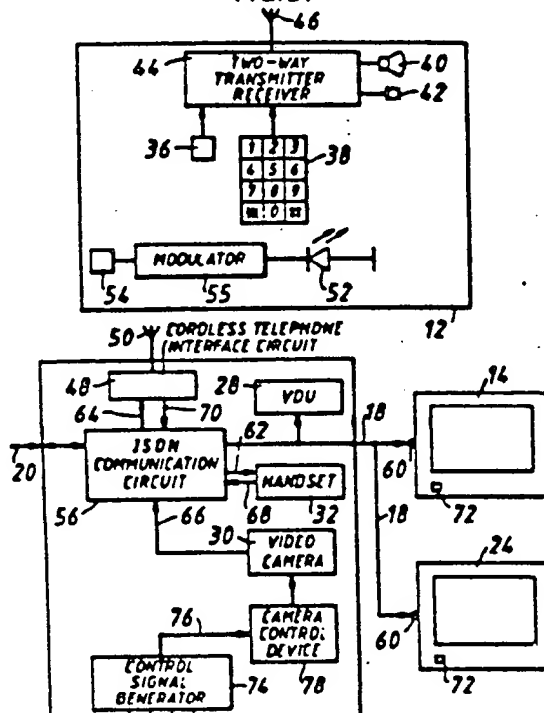
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(54) Videophones

(57) A videophone system includes a videophone 10 having a video camera 30 for producing a first video signal containin first video information representing an image of a user of the videophone, a communication circuit 56 connected to receive the first video signal and capable of transmitting the first video information via a line 20, connected to the videophone and forming part of a switched network, to a remote party, and of producing a second video signal from second video information received from the network and representing an image of the remote party, a display unit 28 for receiving the second video signal and displaying the image of the remote party, and a cordless telephone interface circuit 48 connected to the communication circuit 50. The videophone system also includes a cordless telephone 12 that has audio transducer means 40, 42 and a two-way transmitter/receiver 44 capable of communicating with the communication circuit 56 of the videophone 10, via the cordless telephone interface circuit 48, such that the user can converse with a remote party from tl cordless telephone. The cordless telephone 12 has an infra-red LED 52 which when illuminated by pressing button 54 causes the videocamera 30 to track the telephone. Any television sets in the same room, 14, or adjacent rooms, 24, may be coupled to the videophone and arranged on receipt of the LED signal to switch from T.V. mode to display the videophc image.

FIG. 5.



AP7

FIG. 1.

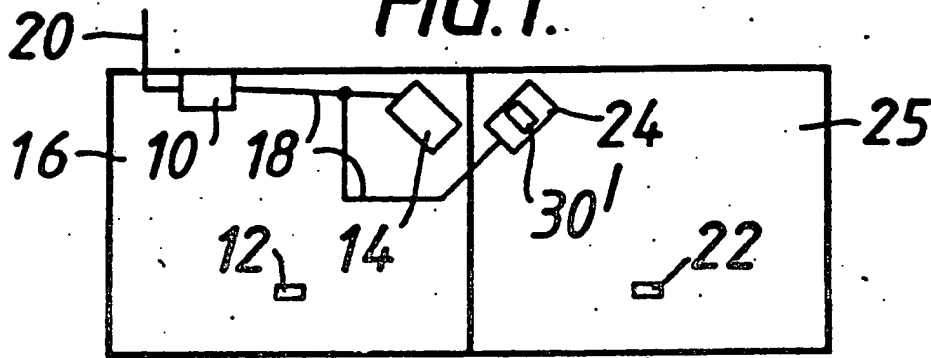


FIG. 2.

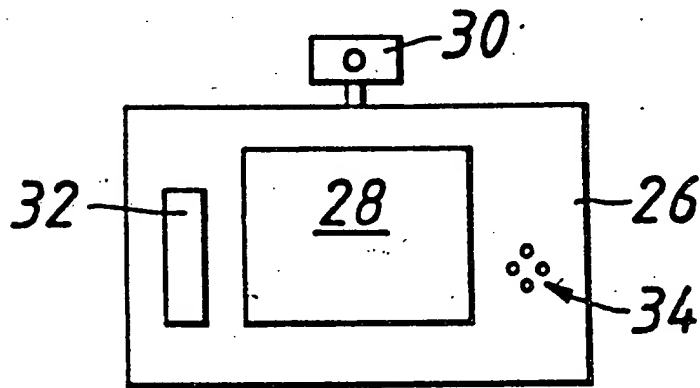


FIG. 3.

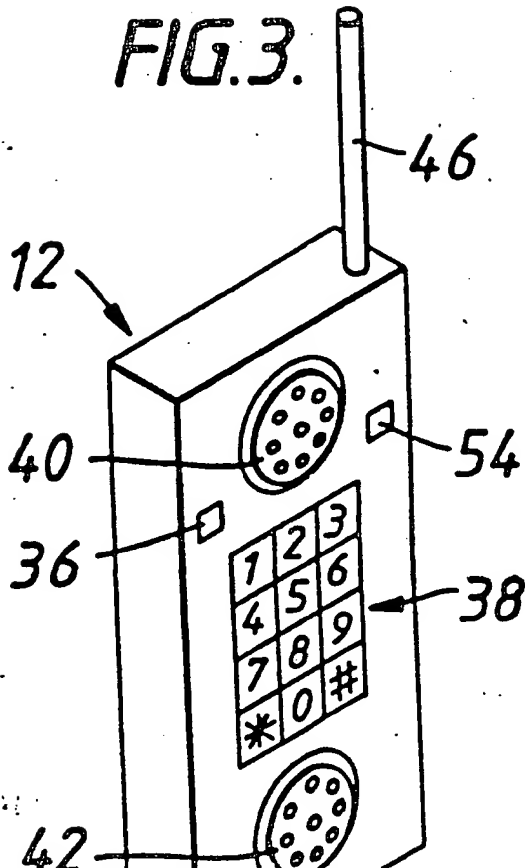


FIG. 4.

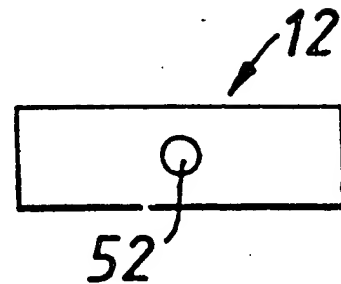
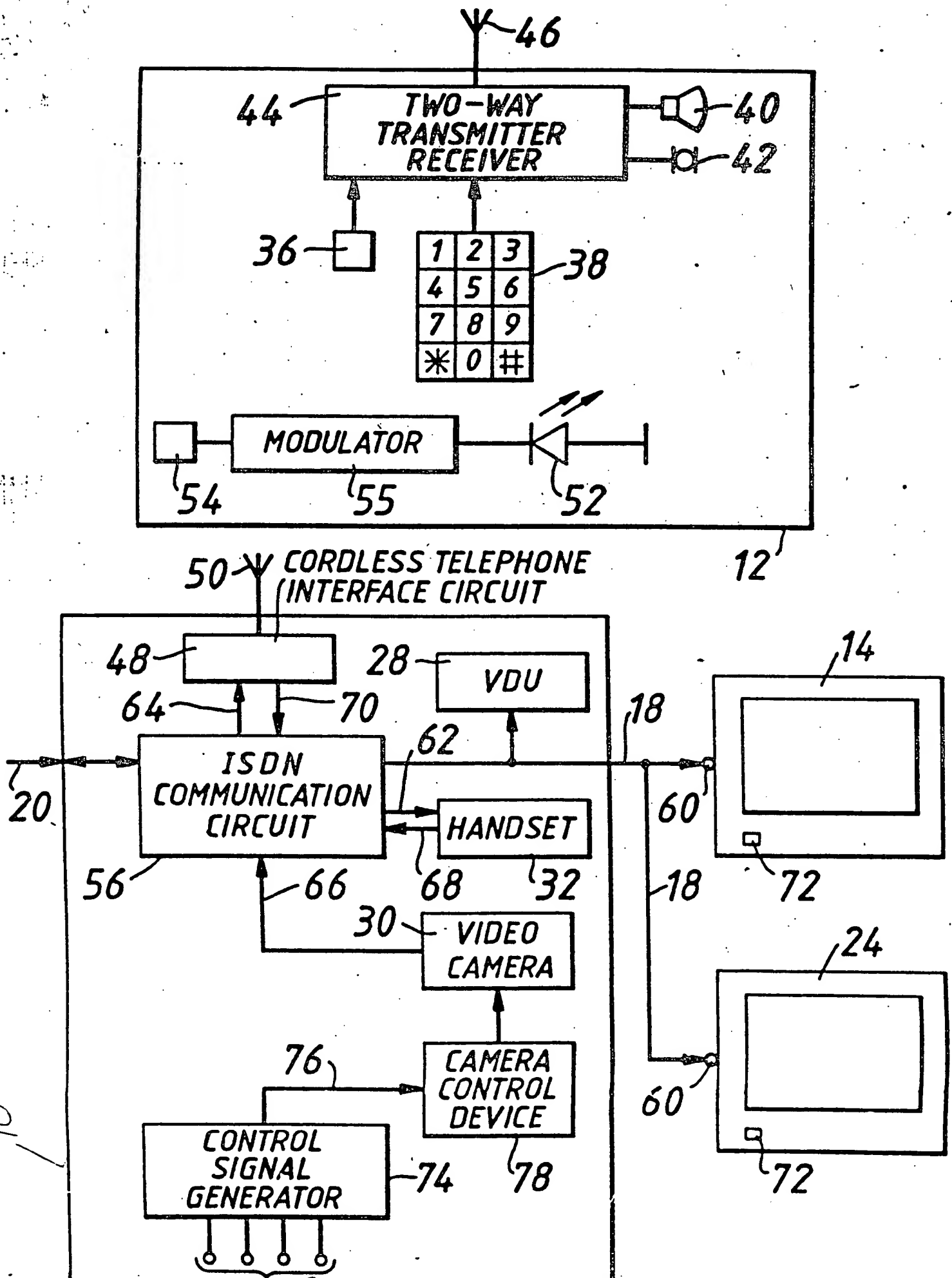


FIG. 5.



VIDEOPHONES

This invention relates to videophones.

Videophones, that is to say devices that enable people
5 selectively to communicate with one another via a switched network in
like manner to ordinary (audio only) telephones, but with the facility
(in addition to that of conversing with one another) of seeing images
of one another, have been technically possible for some time. However,
their widespread use awaits the installation of networks that are of
10 broad enough bandwidth to carry image (as well as audio) information.

It might be expected that a videophone would comprise video
camera means for producing a first video signal representing an image
of the user of the videophone and display means for displaying a second
video signal representing an image of a remote party, the signals being
15 transmitted between the user and remote party by way of a switched
network. To use the videophone, the user would have to position
himself in front of the videophone, so as to be able to view the
display means and so as to be in the field of view of the video camera
means and in the range of a handset or microphone/loudspeaker used for
20 conversation, and use appropriate controls of the videophone either to
respond to an incoming call or to establish an outgoing call. Bearing
in mind that videophones are likely to be considerably more expensive
than and/or of considerably larger size than ordinary (audio only)
telephones, whereby the ordinary user probably would not have several
25 videophones in different rooms, the need to use a videophone in this
manner would represent a substantial inconvenience. For example, the
user would have to hurry (maybe from another room or floor or from
outside of a house in which the videophone is installed) to answer an
incoming call, which might be annoying or difficult for a fit person
30 and impossible for an old person or invalid. Further, and this would
be the case even if the user had several videophones installed in
different rooms, the need to stay in front of the videophone to use it
could cause discomfort and inconvenience.

According to the invention there is provided a videophone system
35 comprising:

a videophone having

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first video information representing an image of a user of the videophone,

a communication circuit connected to receive the first video signal and capable of transmitting the first video information via a switched network to a remote party and of producing a second video signal from second video information received from the network and representing an image of the remote party,

display means for receiving the second video signal and displaying the image of the remote party, and

a cordless telephone interface circuit connected to the communication circuit; and

a cordless telephone that comprises audio transducer means and two-way transmitter/receiver means capable of communicating with said communication circuit of the videophone, via said cordless telephone interface circuit, such that the user can conduct a two-way conversation with a remote party from the cordless telephone.

With such a system or arrangement, the user does not have to stay in position in front of the videophone during the course of a call. The user can move away from the videophone (possibly going out of the field of view of the video camera means) while remaining in voice communication with the remote party, for example if the user becomes uncomfortable or has to carry out some other task (for example answering the door or attending to a child or to cooking).

Preferably, the cordless telephone has a hook switch and dialling means connected to the two-way transmitter/receiver means for enabling the user to respond to an incoming call from the cordless telephone and to establish an outgoing call from the cordless telephone. This feature provides the added convenience that the user does not have to be positioned adjacent the videophone to receive or make a call. This is particularly convenient in the case of an incoming call, since the user can respond to the call from his current location (assuming he has the cordless telephone with him) and can then walk at his leisure to the location of the videophone and position himself in the field of view of the video camera means thereof to enable the other party to see him. The feature is even more valuable when the user is not able or willing to walk to the location of the videophone, since he can

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cannot see him.

Advantageously, the videophone system comprises a television receiver having an input terminal and remote control receiver means responsive to receipt of a remote command to display a video signal applied to said input terminal, said input terminal being connected to the videophone to receive said second video signal, and the cordless telephone has transmitter means for selectively supplying said remote command to the television receiver. If this feature is provided, the user can use the cordless telephone to actuate the television receiver to display the image of the remote party. One advantage of this feature is that if, for example, the television receiver is in the same room as the videophone and is being used, the distraction of the television programme material can be removed. (The image of the other party can be displayed instead of the television programme material or, if the receiver has a picture in picture (PIP) facility or picture out of picture (POP) facility, the two images can be viewed on a PIP or POP basis, desirably with muting of the television programme sound.) Another advantage of this feature is that, depending upon the location of the television receiver, it may be possible to see an image of the remote party at a location remote from the videophone. Thus, the user may be able still to see the image of the remote party if the user moves away from the videophone during the course of a call. Also, another person in a location away from the videophone will be able to see an image of the caller. Further, should he wish, the user can use this facility to see a caller before positioning himself so as to be in the field of view of the video camera means (and therefore be visible to the caller).

The videophone system may comprise at least one further television receiver having an input terminal and remote control receiver means responsive to receipt of a said remote command to display a video signal applied to said input terminal, said input terminal of the at least one further television receiver being connected to the videophone to receive said second video signal. With this feature the user could, for example, continue to maintain an image of the remote party in his sight while moving about (for instance from room to room) during the course of a call.

video camera means and detector means responsive to a signal emitted by the cordless telephone to cause the camera control means to move the video camera means so as to point it towards the cordless telephone. This feature has the advantage that the user can position himself
5 wherever he wishes (for example in a comfortable chair or at a desk) within the range of movement of the video camera means and can readily cause the camera to track him so that his image remains available to the remote party.

In the case where the videophone system comprises both the
10 television receiver and movable camera means features mentioned above, the transmitter means of the cordless telephone may be capable of emitting the signal to which the detector means is responsive as well as the remote command to which the remote control receiver means of the television receiver is responsive. In this case the transmitter means
15 may, for example, comprise a source of radiation (for instance a light emitting diode) that can be directed towards either the remote control receiver means of the television receiver or the detector means of the videophone by suitable orienting the cordless telephone, and means for modulating the radiation, the radiation constituting the remote command
20 to which the remote control receiver means is responsive and the modulation of the radiation constituting the signal to which the detector means is responsive.

The videophone system may comprise a further video camera means positioned on the above-mentioned television receiver for producing a
25 third video signal containing third video information representing an image of someone positioned before the television receiver, the further video camera means being connected to said communication circuit whereby the third video information may be sent via the switched network to the remote party. As explained below, this enhances the
30 convenience with which the videophone system can be used.

The convenience with which the videophone system may be used may be further enhanced if the system comprises at least one further cordless telephone as set forth above.

The videophone of the videophone system may be connected to a
35 line forming part of an International Standard Data Network (ISDN) constituting said switched network. Such a line is suitable for

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extensive ISDNs comprising such lines will be constructed in due course.

The invention will now be further described, by way of illustrative and non-limiting example, with reference to the accompanying drawings, in which:

Figure 1 is a plan view of two rooms of a house in which a videophone system embodying the invention is installed;

Figure 2 is a front view of a videophone forming part of the videophone system;

Figure 3 is a front perspective view of a cordless telephone forming part of the videophone system;

Figure 4 is a view of the cordless telephone from below; and

Figure 5 is a schematic block diagram of the videophone system.

The drawings show a videophone system that comprises a videophone 10, a cordless telephone 12 and a colour television (TV) receiver 14. As shown in Figure 1, the foregoing components of the videophone system are all located in a room 16 which may, for example, be a living room of a domestic household. The videophone 10 is connected to the TV receiver 14 by cabling 18. A line 20 that forms part of a public switched International Standard Data Network (ISDN) enters the household and is connected to the videophone 10.

The illustrated videophone system may, as shown, comprise a further cordless telephone 22 and a further colour TV receiver 24. As shown in Figure 1, the further cordless telephone 22 and further colour TV receiver 24 are located in a room 25 which, though shown as being adjacent to the room 16, need not be so. The further colour TV receiver 24 is connected to the videophone 10 by the cabling 18.

As shown in Figure 2, the videophone 10 comprises a cabinet 26 housing a video display unit (VDU) 28 which may be in the form of a monitor cathode ray tube (CRT) and which is visible from the front of the videophone. In use, an image of a remote party is displayed on the VDU 28.

A video camera 30 (which may be a fixed focus or autofocus camera) is mounted on the cabinet 26 and has a field of view such that it will capture an image of a user positioned in front of the videophone 10. The camera 30 is movable (as described below) such that

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camera to be pointed towards him.

The videophone 10 may also be provided with a handset 32 which, as shown, may be mounted on the front of the cabinet 26. The handset 32 may be of very similar form and function to the handset of an ordinary (audio only) telephone. Thus, it is connected to the videophone 10 by a cord (not shown), and may comprise a "hook" key or keys (not shown) for responding to or initiating a call and for clearing down at the end of a call, and a keypad (not shown) for dialling the number of a subscriber to be called.

Four light sensors or detectors 34 are arrayed as shown in Figure 2 on the front of the cabinet 26. Alternatively, in order to simplify an operation (described below) of aligning the camera 30 with the direction of receipt of radiation, the sensors 34 may be mounted so as to move with the camera. For example, the sensors 34 may be mounted on a base of the camera 30.

The cordless telephone 12 is shown in more detail in Figures 3, 4 and 5. The cordless telephone 12 may be of very similar construction and operation to a cordless telephone for use with an ordinary (audio only) telephone system. Thus, it comprises a hook button 36 for operating a hook switch to respond to or initiate a call and to clear down at the end of a call, a keypad 38 comprising keys for dialling the number of a subscriber to be called, audio transducer means in the form of a speaker 40 and a microphone 42, and a two-way (duplex) transmitter/receiver 44 connected to the components 36, 38, 40 and 42 and to an aerial 46 for communicating by radio with a cordless telephone interface circuit 48, having a complementary two-way (duplex) transmitter/receiver (not shown) and provided with an aerial 50, in the videophone 10, such that a two-way (duplex) conversation can be conducted between a user of the videophone system employing the cordless telephone 12 and a remote party.

The transmitter/receiver 44 of the cordless telephone 12 and the transmitter/receiver of the cordless telephone interface circuit 48 may achieve duplex communication between each other by employing different frequencies for the respective directions of transmission. Alternatively, use may be made of more modern digital transmission technology, for example as used in the "CT2" (Cordless Telephone 2)

according to which duplex communication can be achieved using a single frequency.

The cordless telephone 12 further comprises a light emitting diode (LED) 52 at its bottom (see Figure 4) and a button 54 which, when pressed, energises the LED 52 to emit radiation. More specifically, when the button 54 is pressed the LED 52 is energised via a modulator 55 to emit radiation modulated at a frequency of a value described below. The modulating frequency of the modulator 55 may be derived from a crystal oscillator (not shown) of the transmitter/receiver 44 of the cordless telephone 12, for example by way of a frequency divider (not shown).

The cordless telephone 22 may be of exactly the same construction as the cordless telephone 12 except that they should employ different frequencies to one another in order to avoid mutual interference.

The construction of the videophone 10 is shown in more detail in Figure 5. The videophone 10 includes an ISDN communication circuit 56 which is operative to convert data (in ISDN format), arriving on the ISDN line 20 from a remote party wishing to establish communication with the videophone, or in communication with the videophone, which data contains video information representing an image of the remote party, audio information representing speech of the remote party, and ringing information, into a video signal containing the video information representing the image of the remote party and an audio signal containing the audio information representing the speech of the remote party and the ringing information. The video signal is supplied via a line 58 to the VDU 28 and, via the cabling 18, to video input terminals 60 of the TV receivers 14 and 24. The audio signal is supplied via lines 62 and 64 to the handset 32 and the cordless telephone interface circuit 48, respectively.

The video camera 30 is connected to the ISDN communication circuit 56 by a line 66 so as to supply thereto a video signal containing video information representing an image of the user (positioned in the field of view of the camera). The handset 32 and the cordless telephone interface circuit 46 are connected to the ISDN communication circuit 56 via lines 68 and 70, respectively, to supply thereto an audio signal containing audio information represents speech

communication circuit 56 is operative to convert the video signal from the camera 30 and the audio signal from either the handset 32 or the cordless telephone 12 into data in ISDN format and to send the ISDN data to a remote party with whom communication has been established, or with whom it is desired that communication be established, by way of the switched network of which the ISDN line 20 forms part.

Each of the TV receivers 14 and 24 may be a conventional colour TV receiver incorporating a remote control receiver that includes a light detector or sensor 72, the remote control receiver being responsive to a remote command (radiation received by the sensor 72 from the LED 52 of the cordless telephone 12 or 22) to: if the receiver is displaying a TV programme, switch to displaying any video signal applied to the video input terminal 60; and, if the receiver is not powered up, to power it up and cause it to display any video signal applied to the video input terminal 60. (If either of the TV receivers 14 and 24 has a picture in picture (PIP) facility or picture out of picture (POP) facility, it may instead be responsive to the remote command, at least if a TV programme is already being displayed, to display both the TV programme and the image of the remote party on a PIP basis, that is with one (for example the image of the remote party) inset in the other, or on a POP basis, and with the programme sound muted.) The remote control receivers of the TV receivers 14 and 24 are (or need not be) sensitive to the modulation of the radiation emitted by the LED 52 of the cordless telephone 12. The modulation is employed for another purpose (see below).

(The videophone 10 further comprises a control signal generator 74 connected to outputs of the four light sensors 34 of the videophone 10. The sensors 34 produce respective output signals representing the modulation of the radiation emitted from the LED 52 of the cordless telephone 12 or 22. In a manner known per se from analogous applications (light-seeking servomechanisms), the generator 74 is responsive to phase differences in two orthogonal directions between the signals produced by the array of sensors 34 when they receive radiation from the LED 52 of the cordless telephone 12 or 22 to generate a signal or signals indicative of the direction from which the radiation is coming. (The frequency of the modulation of the LED 52 is

differences can easily be detected and such that there is only one direction which will produce phase balancing in the two orthogonal directions.) The direction-indicative signal or signals are supplied via a line 76 to a camera control device 78 (comprising, for example, electric motors for rotating and tilting the camera 30) which is responsive to the signal or signals to move the camera so as to point it towards the source of the radiation, that is to say towards the cordless telephone 12 or 22. If the sensors 34 are mounted (as mentioned above) so as to be movable with the camera 30, the direction indicative signal or signals will reduce as the camera moves into alignment with the direction of the user and will reach a minimum when the camera is pointing towards the user.

In principle, the radiation emitted by the LED 52 of each cordless telephone 12 and 22 (and sensed by the sensors 34 of the videophone 10 and the sensors 72 of the TV receivers 14 and 24) could be of various wavelengths (not necessarily restricted to light radiation). Preferably, however, light radiation is employed and, more preferably still, infra-red (IR) radiation is employed. In this regard, colour TV receivers which are responsive to remote commands in the form of IR radiation are already available, whereby such a receiver can be used in the present videophone system with no or little modification, provided that the modulation of the IR radiation from the LED 52 used for controlling the camera 30 does not interfere with the operation of the receiver.

The above-described videophone system is operated in the following manner. To make an outgoing call, the user picks up the handset 32 or either of the cordless telephones 12 and 22 and presses its hook button (36 for the cordless telephone 12). The ISDN communication circuit 56 is responsive thereto to gain access to the switched network via the ISDN line 20 and to cause powering up of those components of the videophone 10 (at least the VDU 28 and the camera 30) that do not need to be powered up when the videophone is not in use. The user then uses the keypad of the handset 32 or the keypad 38 of the cordless telephone 12 or 22 to generate dialling information representing the number of the remote party with whom videophone contact is desired and the ISDN communication circuit 56 converts the

switched network via () ISDN line 20.

If the user is in the room 16 in which the videophone 10 is installed, and if he is using the cordless telephone 12 and is not positioned in (or in the centre of) the field of view of the video camera 30, he can point the LED 52 of the cordless telephone towards the videophone 10 and press the button 54 on the cordless telephone so as to energise the LED, whereby the camera will be moved to point towards the cordless telephone and therefore towards the user. Also, if the TV receiver 14 is displaying a TV programme, the user can point the LED 52 of the cordless telephone 12 towards the TV receiver and, by pressing the button 54 to energise the LED 52, cause the receiver to switch to display the video signal to be received from the called party (rather than the TV programme) so that the user will not be distracted by the TV programme.

The LED 52 may be situated anywhere on the cordless telephone 12. It is convenient, however, to site it (as mentioned above and as illustrated in Figure 4) on the bottom or base of the cordless telephone 12, since in a normal use position of the cordless telephone the user usually will be holding the cordless telephone so that its bottom is pointing more or less away from him.

The switched network supplies ringing information data to the videophone of the dialled remote party, causing ringing to take place at that videophone, and, when the remote party responds, the user can converse with him (that is, conduct two-way (duplex) verbal communication with him) via the handset 32 or the cordless telephone 12 or 22. The user sees an image of the called party on the VDU 28 of his videophone 10 and, in like manner, the called party sees an image of the user (the calling party) on the VDU of his videophone.

Should the user have occasion to move about the room 16 during the call, he can move the camera 30 as necessary to point towards him by pointing the cordless telephone 12 towards the videophone 10 and pressing the button 54 to energise the LED 52. Also, if he moves to a position in the room 16 where he cannot see, or cannot readily see, the VDU 28, but can see the screen of the TV receiver 14, he can (if he has not already done so) point the cordless telephone 12 towards the TV receiver 14 and press the button 54 to energise the LED 52, whereby an image of the called party will be visible to him on the TV receiver 14.

Should the user have occasion to leave the room 16 during the call, he can remain in voice contact with the remote party by taking the cordless telephone 12 with him. Further, if, for example, he goes into the room 25, he can point the cordless telephone 12 towards the TV receiver 24 and use the button 54 to cause an image of the remote party to be displayed on the TV receiver 24 so that he can see the remote party (though the remote party cannot see him).

Should someone else, for example someone in the room 25, wish to monitor the call, he can do so by means of the cordless telephone 22. That is, he can listen to the conversation by means of the cordless telephone 22 and/or he can see an image of the remote party (without himself being seen) by pointing the cordless telephone towards the TV receiver 24 and pressing the button 54 to energise the LED 52 to cause an image of the called party to be displayed on the TV receiver 24.

When an incoming call is received (as signalled by ringing at the videophone 10 and the cordless telephones 12 and 22 brought about by the ISDN communication circuit 56 when it receives ringing information data from the network via the ISDN line 20) and the user is in the room 16, he can respond to and conduct the call, using the handset 32 or the cordless telephone 12, in much the same way as that in which he initiated and conducted an outgoing call. If, on the other hand, the user is not in the room 16, for example if he is in the room 25, he can respond to the call using the cordless telephone 22, establish voice communication, and proceed at his leisure into the room 16 to establish visual communication via the videophone 10.

If the user is unable to go to the room 16, for example because he is an invalid, he can still conduct a conversation via the cordless telephone 22. Moreover, he can see an image of the called party by using the cordless telephone 22 to cause the image to be displayed on the TV receiver 24.

It is easy, with the above-described videophone system, for the user to look at a person making an incoming call before deciding how to respond. The user simply has to position himself out of the field of view of the camera 30 (if not already so positioned) and look at an image of the calling party on the VDU 28 or on one of the TV receivers 14 and 24. The user can then decide to respond normally, not to respond at all (that is to ring off at once) or to respond by voice

only without making himself visible to the calling party.

The invention can, of course, be carried into effect in other ways than that described above by way of example. For example, at least one portable video camera similar to the camera 30 could be placed on a TV receiver in another room to the room 16 containing the videophone 10, for example on the TV receiver 24 in the room 25 (as shown at 30' in Figure 1). The further camera 30' may have sensors like the sensors 34, a control signal generator like the control signal generator 74, and a camera control device like the camera control device 78, whereby it could be caused (in similar manner to the camera 30) to point at a user in the other room. The further camera 30' would be connected to the ISDN communication circuit 56; and switching circuits might be provided to switch off the camera 30 of the videophone, and to switch on the further camera 30' (and vice versa), on demand, so that the image from either the camera 30 or the camera 30' could be sent to the remote party. Alternatively, it would be possible to combine and send both such images.

Thus, the user could establish or respond to a call while remaining in the room 25, or move from the room 16 into the room 25 during the course of a call, and still be visible to a remote party.

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CLAIMS

1. A videophone system comprising:

a videophone having

5 video camera means for producing a first video signal containing first video information representing an image of a user of the videophone,

10 a communication circuit connected to receive the first video signal and capable of transmitting the first video information via a switched network to a remote party and of producing a second video signal from second video information received from the network and representing an image of the remote party,

 display means for receiving the second video signal and displaying the image of the remote party, and

15 a cordless telephone interface circuit connected to the communication circuit; and

20 a cordless telephone that comprises audio transducer means and two-way transmitter/receiver means capable of communicating with said communication circuit of the videophone, via said cordless telephone interface circuit, such that the user can conduct a two-way conversation with a remote party from the cordless telephone.

2. A videophone system according to claim 1, wherein the cordless telephone has a hook switch and dialling means connected to
25 the two-way transmitter/receiver means for enabling the user to respond to an incoming call from the cordless telephone and to establish an outgoing call from the cordless telephone.

3. A videophone system according to claim 1 or claim 2, which
30 comprises a television receiver having an input terminal and remote control receiver means responsive to receipt of a remote command to display a video signal applied to said input terminal, said input terminal being connected to the videophone to receive said second video signal, and in which the cordless telephone has transmitter means for
35 selectively supplying said remote command to the television receiver.

4. A videophone system according to claim 3, wherein the

television receiver is responsive to said remote command to display said second video signal in place of any signal being displayed by the receiver prior to supply of the remote command.

5 5. A videophone system according to claim 3, wherein the television receiver is a picture in picture or picture out of picture receiver and is responsive to said remote command to display said second video signal, and any signal being displayed by the receiver prior to supply of the remote command, on a picture in picture or
10 picture out of picture basis.

 6. A videophone system according to claim 3, claim 4 or claim 5, comprising at least one further television receiver having an input terminal and remote control receiver means responsive to receipt of a
15 said remote command to display a video signal applied to said input terminal, said input terminal of the at least one further television receiver being connected to the videophone to receive said second video signal.

20 7. A videophone system according to any one of the preceding claims, wherein the videophone comprises camera control means for moving the video camera means and detector means responsive to a signal emitted by the cordless telephone to cause the camera control means to move the video camera means so as to point it towards the cordless
25 telephone.

 8. A videophone system according to any one of claims 3 to 6, wherein the videophone comprises camera control means for moving the video camera means and detector means responsive to a signal emitted by
30 the cordless telephone to cause the camera control means to move the video camera means so as to point it towards the cordless telephone, and wherein said transmitter means of the cordless telephone is capable of emitting said signal to which the detector means is responsive as well as supplying said remote command to which the remote control
35 receiver means of the television receiver is responsive.

transmitter means comprises a source of radiation that can be directed towards either the remote control receiver means of the television receiver or the detector means of the videophone by suitable orienting the cordless telephone, and means for modulating the radiation, the radiation constituting said remote command to which the remote control receiver means of the television receiver is responsive and the modulation of the radiation constituting said signal to which the detector means is responsive.

10 10. A videophone system according to any one of claims 3 to 6, 8 and 9, which comprises a further video camera means positioned on the television receiver for producing a third video signal containing third video information representing an image of someone positioned before the television receiver, the further video camera means being connected to said communication circuit whereby the third video information may be sent via the switched network to the remote party.

20 11. A videophone system according to any one of the preceding claims, comprising at least one further cordless telephone that comprises audio transducer means and two-way transmitter/receiver means capable of communicating with said communication circuit of the videophone, via said cordless telephone interface circuit, such that the user can conduct a two-way conversation with a remote party from the cordless telephone.

25 12. A videophone system according to claim 11, wherein the at least one further cordless telephone has a hook switch and dialling means connected to the two-way transmitter/receiver means for enabling the user to respond to an incoming call from the at least one further cordless telephone and to establish an outgoing call from the at least one further cordless telephone.

35 13. A videophone system according to any one of the preceding claims, wherein the videophone is connected to a line forming part of an International Standard Data Network constituting said switched network.

14. A videophone system substantially as herein described with reference to the accompanying drawings.